CLAIMS

What is claimed is:

1.   An information storage medium useable by a recording and/or reproducing apparatus, the medium comprising:

audio/video (AV) data; and

interactive data to be reproduced with the AV data when reproduced by the apparatus in an interactive mode,

wherein:

the interactive data comprises a plurality of ENAV units, each of the ENAV units have a size less than a predetermined size, and

information used by the apparatus to reproduce each of the ENAV units with a corresponding portion of the AV data.

2.   The information storage medium of claim 1, wherein:

the interactive data includes link information between the AV data and the ENAV units, and

the link information is described by using a structure of the AV data.

3.   The information storage medium of portions of claim 1, wherein:

the interactive data includes link information between the AV data and the corresponding ENAV units, and

the link information is described using reproducing time information of the AV data.

4.   The information storage medium of claim 1, wherein each of the ENAV units has at least one ENAV page that includes synchronization information indicating a time at which to display the ENAV page.

5.   The information storage medium of claim 4, wherein:

the interactive data includes markup documents and markup resources linked to the markup document,

one of the markup documents includes a startup file which includes link information that links the portions of the AV data and the corresponding ENAV-units, and

for each ENAV page, a corresponding markup document includes the synchronization information corresponding to the ENAV page.

6.   The information storage medium of claim 5, wherein the AV data comprises DVD-Video data having a presentation time stamp, and the link information and the synchronization information are described using the presentation time stamp of the DVD-Video data.

7.   An information storage medium useable by a recording and/or reproducing apparatus, the medium comprising:

audio/video (AV) data; and

interactive data to be reproduced with the AV data when reproduced by the apparatus in an interactive mode,

wherein:

the interactive data comprises a plurality of ENAV units, each of which is smaller than a predetermined size,

each ENAV unit includes a start page stored with a predetermined start file name, and

the interactive data includes information used by the apparatus such that the ENAV units are to be reproduced with corresponding portions of the AV data.

8.   The information storage medium of claim 7, wherein each the ENAV unit has at least one ENAV page, and the at least one ENAV page includes the start page.

9.   The information storage medium of claim 7, wherein the interactive data includes a markup document and markup resources linked to the markup document.

10.   The information storage medium of claim 7, wherein the AV data comprises DVD-Video data.

11.   An information storage medium useable by a recording and/or reproducing apparatus having an ENAV buffer, the medium comprising:

audio/video (AV) data; and

interactive data for to be reproduced with the AV data when reproduced by the apparatus in an interactive mode,

16

wherein:

the interactive data includes at least one ENAV page to be reproduced with the AV data, and

the ENAV page includes control command information for an ENAV buffer which is used by the apparatus to buffer the ENAV page according to the control command information recorded in the ENAV page.

12.   The information storage medium of claim 11, wherein the control command information commands data stored in the ENAV buffer to be discarded.

13.   The information storage medium of claim 11, wherein the interactive data is divided into a plurality of ENAV units containing corresponding the ENAV pages including the at least one ENAV page.

14.   The information storage medium of claim 13, wherein the control command information commands an existing ENAV unit stored in the ENAV buffer to be discarded and a next ENAV unit to be read into the ENAV buffer.

15.   An apparatus for recording and/or reproducing, in an interactive mode, a medium having audio/video (AV) data and interactive data, the apparatus comprising:

a transfer unit that transfers the AV data and the interactive data with respect to the medium;

an ENAV buffer which buffers at least one of the ENAV units of the interactive data, the interactive data being recorded in a plurality of the ENAV units and each of the ENAV units is smaller than a predetermined size and is reproduced with a corresponding portion of the AV data when reproduced in the interactive mode;

an ENAV buffer manager which controls the ENAV buffer so that ones of the ENAV units of the interactive data are read into the ENAV buffer and discarded from respect to the ENAV buffer; and

a reproducing unit that reproduces and combines the portion of the AV data and the at least one buffered ENAV unit.

16.   The apparatus of claim 15, wherein:

the interactive data further comprises link information between portions of the AV data and the corresponding ENAV units and which is described using a structure of the AV data, and

the ENAV buffer manager refers to the link information to control the ENAV buffer so that the at least one ENAV unit is read into the ENAV buffer before the portion of the AV data corresponding to the at least one ENAV unit is displayed.

17.   The apparatus of claim 15, wherein:

the interactive data further comprises link information between portions of the AV data and the corresponding ENAV units and which is described using reproducing time information of the AV data, and

the ENAV buffer manager refers to the link information to control the ENAV buffer so that the at least one ENAV unit is read into the ENAV buffer before the portion of the AV data corresponding to the at least one ENAV unit is displayed.

18.   The apparatus of claim 15, wherein:

each ENAV unit includes an ENAV page comprising a markup document comprising synchronization information, and

the ENAV buffer manager refers to the synchronization information to control the ENAV buffer so that an ENAV unit corresponding to the synchronization information is read into the ENAV buffer.

19.   The apparatus of claim 18, wherein:

the interactive data further comprises link information between portions of the AV data and the corresponding ENAV units, and

the ENAV buffer manager refers to the synchronization information and the link information to control the ENAV buffer so that the corresponding ENAV unit is read into the ENAV buffer.

20.   The apparatus of claim 19, wherein the interactive data further comprises:

a markup document and markup resources linked to the markup document, and

the markup document includes a startup file including the link information.

21.   The apparatus of claim 19, wherein the AV data is DVD-Video data and the link information and synchronization information are described by using a presentation time stamp of the DVD-Video data.

22.   An apparatus for recording and/or reproducing, in an interactive mode, a medium having audio/video (AV) data and interactive data, the apparatus comprising:
        a transfer unit that transfers the AV data and the interactive data with respect to the medium;
        an ENAV buffer which buffers at least one of the ENAV units of the interactive data, the interactive data being recorded in a plurality of ENAV units, and each of the ENAV units is smaller than a predetermined size and is reproduced with a corresponding portion of the AV data when reproduced in the interactive mode;
        an ENAV buffer manager which controls the ENAV buffer so that, if a start page having a predetermined file name is found in the interactive data, an ENAV unit corresponding to the start page is read into the ENAV buffer; a
        a reproducing unit which reproduces and combines the portion of the AV data and the at least one buffered ENAV unit.

23.   The apparatus of claim 22, wherein at least one of the ENAV units has at least one ENAV page including the start page.

24.   The apparatus of claim 22, wherein the interactive data includes a markup document and markup resources linked to the markup document.

25.   A method of reproducing a medium including audio/video data and interactive data to be reproduced in an interactive mode, the method comprising:
        buffering at least one of ENAV units of the interactive data to be reproduced with a corresponding portion of the AV data in the interactive mode by reading in and discarding the ENAV units, each of the ENAV units being smaller than a predetermined size; and
        reproducing the portion of the AV data in the interactive mode using the buffered at least one ENAV unit.

26.   The method of claim 25, wherein:

the interactive data comprises link information between corresponding portions of the AV data and the ENAV units and is described using a structure of the AV data, and

the buffering the at least one of ENAV units comprises reading the at least one ENAV unit before a portion of the AV data corresponding to the at least one ENAV unit is displayed by referring to the link information.

27.   The method of claim 25, wherein:

the interactive data comprises link information between corresponding portions of the AV data and the ENAV units and is described using reproducing time information of the AV data, and

the buffering the at least one of ENAV units comprises reading the at least one ENAV unit before the portion of AV data corresponding to the at least one ENAV unit is displayed by referring to the link information.

28.   The method of claim 25, wherein:

each ENAV unit includes an ENAV page comprising a markup document comprising synchronization information, and

the buffering the at least one of ENAV units comprises reading the at least one ENAV unit corresponding to the synchronization information by referring to the synchronization information.

29.   The method of claim 28, wherein:

the interactive data further comprises link information between portions of the AV data and the corresponding ENAV units, and

the buffering the at least one of ENAV units comprises reading the at least one ENAV unit by referring to the synchronization information and the link information.

30.   The method of claim 29, wherein the interactive data includes:

a markup document and markup resources linked to the markup document, and

the markup document includes a startup file which includes the link information.

31.   The method of claim 30, wherein the AV data is DVD-Video data and the link information and synchronization information are described by using a presentation time stamp of the DVD-Video data.

32. The information storage medium of claim 1, wherein the interactive data includes buffer control information used by a controller to select one of the plurality of the ENAV units, to buffer the selected ENAV unit in a buffer, and to reproduce the buffered ENAV unit with the corresponding portion of the AV data.

33. The information storage medium of claim 32, wherein the buffer control information is further used by the controller to buffer the selected ENAV unit prior to reproducing the corresponding portion of the AV data.

34. The information storage medium of claim 32, wherein the buffer control information is further used by the controller to empty the buffer prior to buffering the selected ENAV unit.

35. The information storage medium of claim 32, wherein the buffer control information further comprises timing information used by the controller to select the ENAV unit according to a timing of the corresponding portion of the AV data to be reproduced.

36. The information storage medium of claim 35, wherein the buffer control information further comprises identification information disposed in the ENAV units and which is used by the controller to select the ENAV unit according to the timing of the corresponding portion of the AV data to be reproduced.

37. The information storage medium of claim 36, wherein the buffer control information is further used by the controller to buffer the selected ENAV unit prior to reproducing the corresponding portion of the AV data.

38. The information storage medium of claim 37, wherein the buffer control information is further used by the controller to empty the buffer prior to buffering the selected ENAV unit.

39. The apparatus of claim 15, wherein the interactive data includes buffer control information used by the ENAV buffer manager to select one of the plurality of the ENAV units, and to buffer the selected ENAV unit in the ENAV buffer.

21

40.   The apparatus of claim 39, wherein the buffer control information is further used by the ENAV buffer manager to buffer the selected ENAV unit prior to the reproducing unit reproducing the corresponding portion of the AV data.

41.   The apparatus of claim 39, wherein the buffer control information is further used by the ENAV buffer manager to empty the ENAV buffer prior to buffering the selected ENAV unit.

42.   The apparatus of claim 39, wherein the buffer control information further comprises timing information used by the ENAV buffer manager to select the ENAV unit according to a timing of the corresponding portion of the AV data to be reproduced.

43.   The apparatus of claim 42, wherein the buffer control information further comprises identification information disposed in the ENAV units and which is used by the ENAV buffer manager to select the ENAV unit according to the timing of the corresponding portion of the AV data to be reproduced.

44.   The apparatus of claim 43, wherein the buffer control information is further used by the ENAV buffer manager to buffer the selected ENAV unit prior to reproducing the corresponding portion of the AV data.

45.   The apparatus of claim 44, wherein the buffer control information is further used by the ENAV buffer manager to empty the ENAV buffer prior to buffering the selected ENAV unit.

46.   The apparatus of claim 40, further comprising:
an AV buffer that buffers the portion of the AV data, and
an AV reproduction engine that reproduces the portion of the AV data read from the AV buffer to be reproduced with the at least one buffered ENAV unit by the reproducing unit,
wherein the ENAV buffer manager detects from the AV reproduction engine the portion of the AV data to be reproduced, uses the buffer control information and the detected portion of the AV data to select and buffer the ENAV unit in the ENAV buffer prior to the reproducing unit outputting the portion of the AV data.

47.   The apparatus of claim 41, wherein the ENAV buffer comprises first and second buffers, wherein the buffer control information is further used by the ENAV buffer manager to empty the first buffer prior to buffering the selected ENAV unit in the first buffer, and to buffer another ENAV unit in the second buffer as the selected ENAV unit is reproduced by the reproducing unit from the first buffer.

48.   The apparatus of claim 47, wherein the another ENAV unit corresponds to another portion of the AV data to be reproduced by the reproducing unit after the portion of the AV data corresponding to the selected ENAV unit.

49.   The apparatus of claim 39, further comprising a display unit that displays the combined at least one buffered ENAV unit and the portion of the AV data output from the reproducing unit.

50.   An apparatus for recording and/or reproducing a medium having audio/video (AV) data and interactive data, the apparatus comprising:
a transfer unit that transfers the AV data and the interactive data with respect to the medium;
a buffer unit that buffers a portion of the transferred AV data and at least one of a plurality of units of the interactive data, the interactive data being organized in the plurality of the units which are individually reproduced with corresponding portions of the AV data;
a reproduction engine that reproduces the buffered portion of the AV data and the buffered one unit;
a buffer manager that detects the portion of the AV data to be reproduced, selects the one unit from the plurality of the units as corresponding to the portion of the AV data to be reproduced, and controls the buffer unit so that the selected one unit is buffered; and
a combining unit that combines the reproduced portion of the AV data and the reproduced one unit.

51.   The apparatus of claim 50, wherein the buffer unit comprises a first buffer in which the portion of the AV data is buffered, and a second buffer in which the selected one unit is buffered.

23

52.   The apparatus of claim 50, wherein the interactive data includes control information, and the buffer manager uses the control information to select the one unit from the plurality of the units as corresponding to the portion of the AV data to be reproduced, and controls the buffer unit so that the selected one unit is buffered.

53.   The apparatus of claim 52, wherein:

the buffer unit comprises a first buffer in which the selected one unit is buffered, and a second buffer in which the another one of the units is buffered, and

the buffer manager uses the control information to empty the another unit from the second buffer, and to buffer a further one of the units into the second buffer as the one unit is reproduced from the first buffer.

54.   The apparatus of claim 53, wherein the buffer manager uses a buffer empty command included in one of the one unit, the another unit, and the further unit to determine which of the first and second buffers is to be emptied.

55.   The apparatus of claim 50, further comprising a display unit that displays the combined at least one buffered unit and the portion of the AV data output from the combining unit.

56.   A computer readable medium encoded with processing instructions for implementing a method of reproducing a medium including audio/video data and interactive data performed by a computer, the method comprising:

selecting at least one of a plurality of units of the interactive data to be reproduced with a corresponding portion of the AV data, the interactive data being organized in the plurality of the units which are individually reproduced with corresponding portions of the AV data; and

controlling a buffer to buffer the selected one unit prior to the corresponding portion of the AV data being displayed such that the buffered one unit is displayed with the AV data in a combined display.

57.   The computer readable medium of claim 56, wherein the method further comprises detecting the portion of the AV data to be reproduced as the AV data is being reproduced, and the selecting the one unit comprises using the detected portion of the AV data to select the one unit.

58.   The computer readable medium of claim 57, wherein the interactive data further comprises control information, and the selecting the one unit comprises using the control information and the detected portion of the AV data to select the one unit.

59.   The computer readable medium of claim 56, wherein:

the interactive data comprises link information between corresponding portions of the AV data and the units, and

the selecting the one unit comprises using the link information to select the one unit before a portion of the AV data corresponding to the one unit is displayed.

60.   The computer readable medium of claim 59, wherein the link information links corresponding portions of the AV data and the units using reproducing time information of the AV data.

61.   The computer readable medium of claim 59, wherein the one unit includes synchronization information indicating the portion of the AV data with which the one unit corresponds, and the selecting the one unit comprises using the link information and the synchronization information to select the one unit.

62.   The computer readable medium of claim 56, wherein the interactive data includes control information, and the selecting the one unit comprises using the control information to select the one unit from the plurality of the units as corresponding to the portion of the AV data to be reproduced.

63.   The computer readable medium of claim 56, wherein the method further comprises emptying another one of the plurality of units from another buffer as the one unit is reproduced from the buffer, and buffering a further one of the units into the another buffer as the one unit is reproduced from the buffer.

64.   The computer readable medium of claim 63, wherein the emptying another unit from the another buffer comprises using a buffer empty command included in one of the one unit, the another unit, and the further unit to determine which of the buffers is to be emptied.